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09/615,791	07/13/2000	Jordi Ribas-Corbera	KDO:190230-4	5252

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EXAMINER	
RAO, ANAND SHASHIKANT	
ART UNIT	**PAPER NUMBER**
2613	

DATE MAILED: 04/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/615,791	RIBAS-CORBERA ET AL.	
	Examiner	Art Unit	
	Andy S. Rao	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-22_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-22_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

3. Claims 1-2, 6-7, 9-15, and 21-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Benzler et al., (hereinafter referred to as "Benzler").

Benzler discloses a fast search adaptive motion accuracy search method for estimating vectors in motion-compensated video coding by finding a best motion vector for a macroblock (Benzler: column 1, lines 40-57), said method comprising steps of: search a first set of motion vector candidates in a grid of sub-pixel resolution of a predetermined square radius centered on V_1 to find a best motion vector V_2 (Benzler: column 3, lines 57-64); searching a second set of motion vector candidates in a grid sub-pixel resolution of a predetermined square radius centered on V_2 to find a best motion vector V_3 (Benzler: column 3, lines 65-67; column 4, lines 1-20); and searching a third set of motion vector candidate in a grid of sub-pixel resolution of a predetermine square radius centered on V^3 to find said motion vector of said macroblock (Benzler: column 4, lines 37-44), as in claim 1.

Regarding claim 2, Benzler discloses search a first set of eight motion vector candidates in a grid of ½ resolution of square radius 1, centered on V_1 to find a best motion vector V_2 (Benzler: column 4, lines 38-40; figure 2), as in the claim.

Regarding claim 6, Benzler discloses a searching a third set of motion vector candidates in a grid of sub-pixel resolution of a predetermined square radius centered of V_3 to find said best motion of said macroblock further comprising the step of skipping motion vector candidate of said third set of motion vector candidates that have already been tested (Benzler: column 4, lines 43-47), as in the claim.

Regarding claim 7, Benzler discloses using a first filter, second filter, and third filter to perform first, second, and third interpolations (Benzler: column 4, lines 25-30 & lines 52-57; column 5, lines 5-15), as in the claim.

Benzler discloses a fast search adaptive motion accuracy search method for estimating vectors in motion-compensated video coding by finding a best motion vector for a macroblock (Benzler: column 1, lines 40-57), said method comprising steps of: search a first set of motion vector candidates in a grid of sub-pixel resolution of a predetermined square radius centered on V_1 to find a best motion vector V_2 (Benzler: column 3, lines 57-64) using a first filter to do a first interpolation (Benzler: column 4, lines 25-30); searching a second set of motion vector candidates in a grid sub-pixel resolution of a predetermined square radius centered on V_2 to find a best motion vector V_3 (Benzler: column 3, lines 65-67; column 4, lines 1-20) using a second filter to do a second interpolation (Benzler: column 4, lines 52-57); and searching a third set of motion vector candidate in a grid of sub-pixel resolution of a predetermine square radius centered on V_3 to find said motion vector of said macroblock (Benzler: column 4, lines 37-44), using a third filter to do a third interpolation (Benzler: column 5, lines 5-15), as in claim 9.

Regarding claim 10, Benzler discloses using a simple filter to do a coarse interpolation as said first filter (Benzler: column 4, lines 1-5), as in the claim.

Regarding claims 11-12, Benzler discloses using a simple filter to do a coarse interpolation as said first filter (Benzler: column 4, lines 1-5) and using a complex filter to do a fine interpolation as said second filter (Benzler: column 4, lines 50-55), as in the claims.

Regarding claim 13, Benzler discloses using a bilinear filter to interpolate the reference frame by 2x2 (Benzler: column 3, lines 15-20), as in the claim.

Regarding claims 14-15, Benzler discloses using a bilinear filter to do a first interpolation of the reference frame by 2x2 as a first filter (Benzler: column 3, lines 15-20), using a cubic filter to do a fine interpolation as a second filter (Benzler: column 4, lines 50-55; column 5, lines 15-30), as in claims.

Benzler discloses a system for estimating vectors in motion-compensated video coding by finding a best motion vector for a macroblock (Benzler: column 1, lines 40-57; column 4, lines 55-60), said system comprising: a first encoder for searching a first set of motion vector candidates in a grid of sub-pixel resolution of a predetermined square radius centered on V_1 to find a best motion vector V_2 (Benzler: column 3, lines 57-64; column 4, lines 61-65); a second encoder for searching a second set of motion vector candidates in a grid sub-pixel resolution of a predetermined square radius centered on V_2 to find a best motion vector V_3 (Benzler: column 3, lines 65-67; column 4, lines 1-20 & lines 61-65); a third encoder for searching a third set of motion vector candidate in a grid of sub-pixel resolution of a predetermine square radius centered on V^3 to find said motion vector of said macroblock (Benzler: column 4, lines 37-44 & lines 61-65), as in claim 21.

Regarding claim 22, Benzler discloses that the first, second, and third encoders are a single encoder (Benzler: column 4, lines 55-60), as in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benzler et al., (hereinafter referred to as "Benzler") in view of Pearlstein.

Benzler discloses a fast search adaptive motion accuracy search method for estimating vectors in motion-compensated video coding by finding a best motion vector for a macroblock (Benzler: column 1, lines 40-57), said method comprising steps of: search a first set of motion vector candidates in a grid of sub-pixel resolution of a predetermined square radius centered on V_1 to find a best motion vector V_2 (Benzler: column 3, lines 57-64); searching a second set of motion vector candidates in a grid sub-pixel resolution of a predetermined square radius centered on V_2 to find a best motion vector V_3 (Benzler: column 3, lines 65-67; column 4, lines 1-20); and searching a third set of motion vector candidate in a grid of sub-pixel resolution of a predetermine square radius centered on V_3 to find said motion vector of said macroblock (Benzler: column 4, lines 37-44), as in claims 3 and 5. However, Benzler fails to disclose the use if doing subsequent searches using a corresponding set of eight motion vectors using a 1/6 pixel resolution as in the claims. Pearlstein discloses using partial pixel resolutions, such as a 1/3 and 1/6 pixel resolutions (Pearlstein: column 9, lines 40-65) in order to specify fine shifts in motion in order to correct drift in the prediction error of a coded signal (Pearlstein: column 12, lines 1-10). Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to incorporate the use of Pearlstein's teaching of using 1/3 and 1/6 partial pixel resolutions into the Benzler's second and third search steps in order to afford the Benzler method the ability to account for fine motion and correct for drift in the prediction error of its coded signal. The

Benzler method, now incorporating Pearlstein's use of 1/3 and 1/6 partial pixel resolutions has all of the features of claims 3 and 5.

6. Claims 16- 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Benzler et al., (hereinafter referred to as "Benzler") in view of Girod et al., (hereinafter referred to as "Girod").

Benzler discloses a fast search adaptive motion accuracy search method for estimating vectors in motion-compensated video coding by finding a best motion vector for a macroblock (Benzler: column 1, lines 40-57), said method comprising steps of: searching at a first motion accuracy for a first best motion vector of said macroblock (Benzler: column 3, lines 57-64); encoding said first best motion vector and said first motion accuracy (Benzler: column 4, lines 55-65); searching for at least one second best motion vector of said macroblock at an least second motion accuracy (Benzler: column 3, lines 65-67; column 4, lines 1-20) encoding at least one second best motion vector and at least one second motion accuracy (Benzler: column 4, lines 55-65); and selecting the best motion vector of said first and at least one best motion vectors Benzler: column 4, lines 37-44), as in claim 16. However, the Benzler method fails to disclose using a rate-distortion cost measurement, as in the claim. Girod discloses using a rate-distortion cost measurement for coding motion vectors in order to make judicious use of the coding bit budget (Girod: column 8, lines 32-65). Accordingly, given this teaching it would have been obvious for one of ordinary skill in the art to incorporate the Girod teaching of using a rate-distortion cost measurement for selecting motion vectors in order to make judicious use of the coding bit budget of the Benzler method. The Benzler method, now incorporating Girod's teaching of using a rate-distortion cost measurement, has all of the features of claim 16.

Regarding claim 17, the Benzler method, now incorporating Girod's teaching of using a rate-distortion cost measurement, has the step of adapting the rate-distortion criteria according to the different motion accuracies (Girod: column 8, lines 40-50), as in the claim.

Regarding claim 18, the Benzler method, now incorporating Girod's teaching of using a rate-distortion cost measurement, has searching the second motion accuracy finer than said first motion accuracy (Benzler: column 4, lines 35-55), as in the claim.

Regarding claim 19, the Benzler method, now incorporating Girod's teaching of using a rate-distortion cost measurement, has using a rate-distortion criteria (Girod: column 8, lines 33-36), as specified.

Benzler discloses a fast search adaptive motion accuracy search method for estimating vectors in motion-compensated video coding by finding a best motion vector for a macroblock (Benzler: column 1, lines 40-57), said method comprising steps of: searching at a motion accuracy for a best motion vector of said macroblock (Benzler: column 3, lines 57-64); and encoding said best motion vector in the respective accuracy space (Benzler: column 4, lines 55-65), as in claim 20. However, the Benzler method fails to disclose using encoding said motion accuracy using a code from a VLC table that is interpreted differently at different coding units according to the associated motion vector accuracy. Girod discloses using encoding said motion accuracy using a code from a VLC table that is interpreted differently at different coding units according to the associated motion vector accuracy (Girod: column 8, lines 65-67; column 9, lines 18) in order to minimize bit-rates (Girod: column 7, lines 55-65). Accordingly, given this teaching it would have been obvious for one of ordinary skill in the art to incorporate the Girod teaching of encoding said motion accuracy using a code from a VLC table that is interpreted

differently at different coding units according to the associated motion vector accuracy (Girod: column 8, lines 65-67; column 9, lines 18) in order to minimize bit-rates (Girod: column 7, lines 55-65). of the Benzler method. The Benzler method, now incorporating Girod's teaching of encoding said motion accuracy using a code from a VLC table that is interpreted differently at different coding units according to the associated motion vector accuracy, has all of the features of claim 20.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Benzler et al., (hereinafter referred to as "Benzler") in view of Pearlstein and Girod et al., (hereinafter referred to as "Girod").

Benzler discloses a fast search adaptive motion accuracy search method for estimating vectors in motion-compensated video coding by finding a best motion vector for a macroblock (Benzler: column 1, lines 40-57), said method comprising steps of: search a first set of motion vector candidates in a grid of sub-pixel resolution of a predetermined square radius centered on V_1 to find a best motion vector V_2 (Benzler: column 3, lines 57-64); searching a second set of motion vector candidates in a grid sub-pixel resolution of a predetermined square radius centered on V_2 to find a best motion vector V_3 (Benzler: column 3, lines 65-67; column 4, lines 1-20); and searching a third set of motion vector candidate in a grid of sub-pixel resolution of a predetermine squared radius centered on V_3 to find said motion vector of said macroblock (Benzler: column 4, lines 37-44), further comprising the steps of searching three candidates of V2 and a ½ pel location of the lowest cost if V2 is at the center; searching four vector candidates that are closest to V2 if V2 is a corner vector; and determining which of the two corners has a lower cost and searching the four vector candidates that are closest to a line between said corner

with lower cost, if V2 is between two corners (Benzler: column 5, lines 35-54), as in claim 8. However, Benzler fails to disclose doing subsequent searches a 1/3 pixel resolution and using a rate-distortion cost as in the claim. Pearlstein discloses using partial pixel resolutions, such as a 1/3 pixel resolution (Pearlstein: column 9, lines 40-65) in order to specify fine shifts in motion in order to correct drift in the prediction error of a coded signal (Pearlstein: column 12, lines 1-10). Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to incorporate the use of Pearlstein's teaching of using 1/3 partial pixel resolution into the Benzler's second and third search steps in order to afford the Benzler method the ability to account for fine motion and correct for drift in the prediction error of its coded signal. The Benzler method, now incorporating Pearlstein's use of the 1/3 partial pixel resolution has a majority of the features of claim 8, but still fails to disclose using a rate-distortion cost measurement, as in the claim. Girod discloses using a rate-distortion cost measurement for coding motion vectors in order to make judicious use of the coding bit budget (Girod: column 8, lines 32-65). Accordingly, given this teaching it would have been obvious for one of ordinary skill in the art to incorporate the Girod teaching of using a rate-distortion cost measurement for selecting motion vectors in order to make judicious use of the coding bit budget of the Benzler-Pearlstein combination. The Benzler method, now incorporating Pearlstein's use of the 1/3 partial pixel resolution and Girod's teaching of using a rate-distortion cost measurement, has all of the features of claim 8.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Sezan discloses an adaptive global-motion compensated deinterlacing of sequential video fields with post processing.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andy S. Rao whose telephone number is (703)-305-4813. The examiner can normally be reached on Monday-Friday 8 hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris S. Kelley can be reached on (703)-305-4856. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Andy S. Rao
Primary Examiner
Art Unit 2613

ANDY RAO
PRIMARY EXAMINER

asr
March 30, 2004